The Effects of QR Code Prompts Posted to a Solar Charging Bench on Website Visibility

Sage Campbell

Introduction: Paris Agreement

- 2015 United Nations Climate Change Conference in Paris, France
- Document recognizing need to cultivate sustainable future
- Goals and charges for each signatory nation to reduce their individual impacts on the environment
- United States administration withdrew their ratification on June 1st, 2017
  - Government agencies of one of the wealthiest countries ceasing to complete research on climate change

Introduction-Environmental Sustainability in a University Setting

- Universities in United States are a great place for sustainability research and action to be taken
  - History of large research universities with adequate funding to conduct research
  - Research still being conducted if government agencies are not doing it
- University-wide agreements to work towards improved sustainability
  - Talloires Declaration
  - STARS

Introduction-Environmental Sustainability in a University Setting

- Talloires Declaration
  - Created by *Association of University Leaders for a Sustainable Future (ULSF)*
  - Meeting to address the state of the world with 22 university presidents in Talloires, France led by then Tufts University President Jean Mayer
  - Published in October 1990, significantly before Paris Agreement
  - As of July 1st 2018, 504 institutions in 59 countries have signed
  - 10 point plan on how universities pledge to promote a sustainable future
  - Pledge rather than plan of action
  - (ULSF, 2015)

Introduction-Environmental Sustainability in a University Setting

- STARS
  - *Association for the Advancement of Sustainability in Higher Education (AASHE)*
  - *Sustainability Tracking, Assessment & Rating System (STARS)*
  - Universities can complete assessment and receive ratings: Reporter, Bronze, Silver, Gold, Platinum
  - Institutions can work towards credits and gain points towards rating
  - (AASHE, 2019)

Introduction- Sustainability Studies in a University Setting

- *Petersen, Shunturov, Platt, and Weinberger (2007)*
  - Dormitory residents reduce electricity consumption with feedback and incentives
  - Education on an issue combined with feedback would lead to behavior change
  - There was reduction, but specific behaviors not measurable
- *Binder (2012)*
  - Proper sorting behavior of trash and recycling using prompts, more salient bins, and different placement of receptacle

Introduction-Free Choice Learning

- Ballantyne & Packer (2005)
  - Free choice learning
  - Use of exhibits to challenge current perspectives about an issue
  - Can lead to desired sustainability outcomes such as inspiring curiosity about an issue

Introduction- QR Codes

- Lai, Chang, Li, Fan, & Wu (2013)
  - QR codes to increase mobile learning
  - Outdoor environment provides contextual experiences beyond the classroom
    - Related to content
- Gao, Liu, & Paas (2016)
  - Effort of QR code vs. manual selection
  - QR codes can be preferable to manual selection
    - Mixed results, but works with current study
  - Less effort required

Introduction-Barriers to Campus Sustainability

- *Horhota, Asman, Stratton, and Halfacre (2014)*
  - Identified four main behavioral barriers to campus sustainability
    - “Lack of engagement;
    - Communication issues;
    - Lack of proper campus infrastructure;
    - Financial concerns” (Horhota et al., 2014, p.346)
  - Current study aims to alleviate/address all barriers

The Current Study

- Placement of a solar charging bench on WMU campus using QR code graphic prompts in order to increase website traffic
- Aims to address all barriers mentioned by Horhota et al. (2014)
  - Lack of engagement
    - Placement of bench itself- high traffic, large salient bench, free-choice, low effort (QR)
  - Communication issues
    - Info-graphic prompt with instructions and QR code
  - Lack of proper campus infrastructure
    - Installation of bench
  - Financial concerns
    - Grant funded

Method- Participants and Setting

- Participants
  - Any users of solar bench,
  - Any users who scan QR code
- Setting
  - Installation site of Campus XL on WMU Campus (Figure 3)
  - During regular semesters (Fall or Spring)

Method- Apparatus and Materials

- Solar Charging Bench
  - Sunbolt company Campus XL model
  - Two 4’6” W x 1’ 2 ½” L Seats
  - 4’6” W x 3’6” L Table
  - Tilted solar canopy with 8’3 ½” high side and 6’11 ¾” low side clearance
  - 4’6” W x 7’0” L overall footprint
  - ADA Compliant (height/roll up)
    - 80”/ 83”

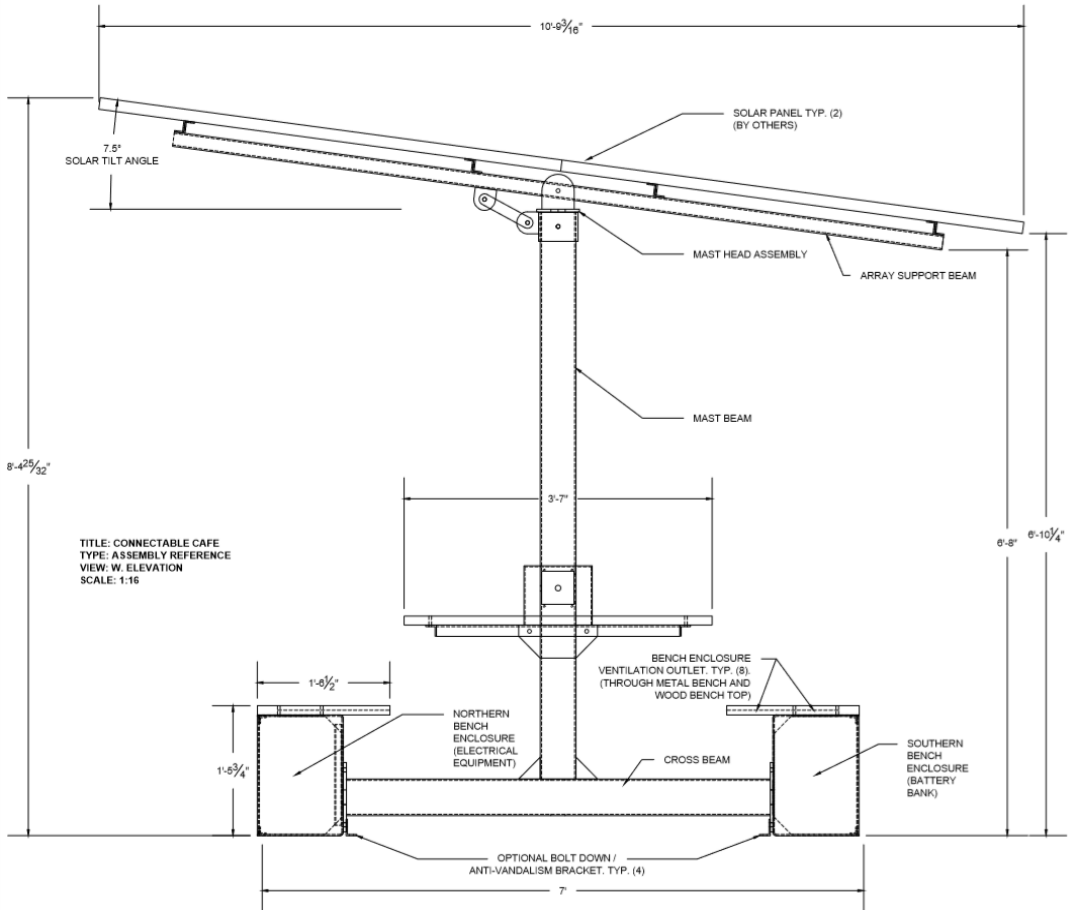

Figure 1. Campus XL measurement drawing depicting all exterior dimensions. Reprinted from the Sunbolt *Installation and Operating Instructions* (p. 21), by Sunbolt. (2018), Campus XL 2018 installation and operating instructions.

Sunbolt Campus XL

- Solar Work Station
- Supports up to 150 handheld mobile device charges per day
- Four 120v electrical receptacles
- Eight USB charging ports
- 90mph wind rating
- 25 year solar panel warranty
- Plug load monitoring system

120 Volt and USB Outlets

ADA Compliant

Powerful Solar Array

Method- Apparatus and Materials

- QR Code Prompt
  - Developed for the purposes of the current study
  - 4” W x 6” L to fit on middle pillar of bench at eyesight
- QR code in upper right corner
  - Will take users to sustainability website
- QR code generated through *qr-code-generator.com* website

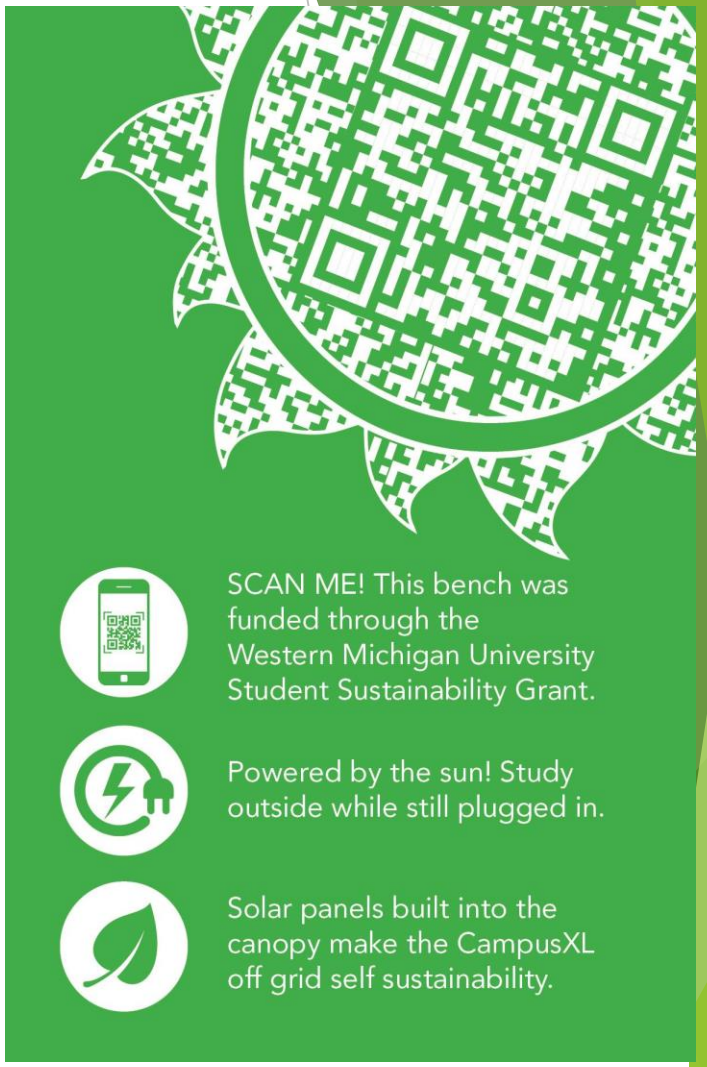

Figure 2. Graphic Prompt: 4.0” x 6.0” as it will appear on the Campus XL Bench. Developed for the current study by Brin Hamilton Photography and Design, (2019, February 11), Campus XL Info-Graphic [Digital image], Retrieved February 11, 2019.

Method- IV and DV

- DV
  - Change in website traffic monitored through general website hits and unique QR code URL
- IV
  - Installation of Campus XL and graphic prompts

Method- Experimental Design and Procedures

- AB Design
  - Generally limited due to no reversal
  - Could take away prompts but no complete reversal by taking away bench
  - Limitation alleviated through unique URL generated by QR code
- *Figure 3*
  - Installation site of solar bench
  - High foot traffic
  - Snow melt area

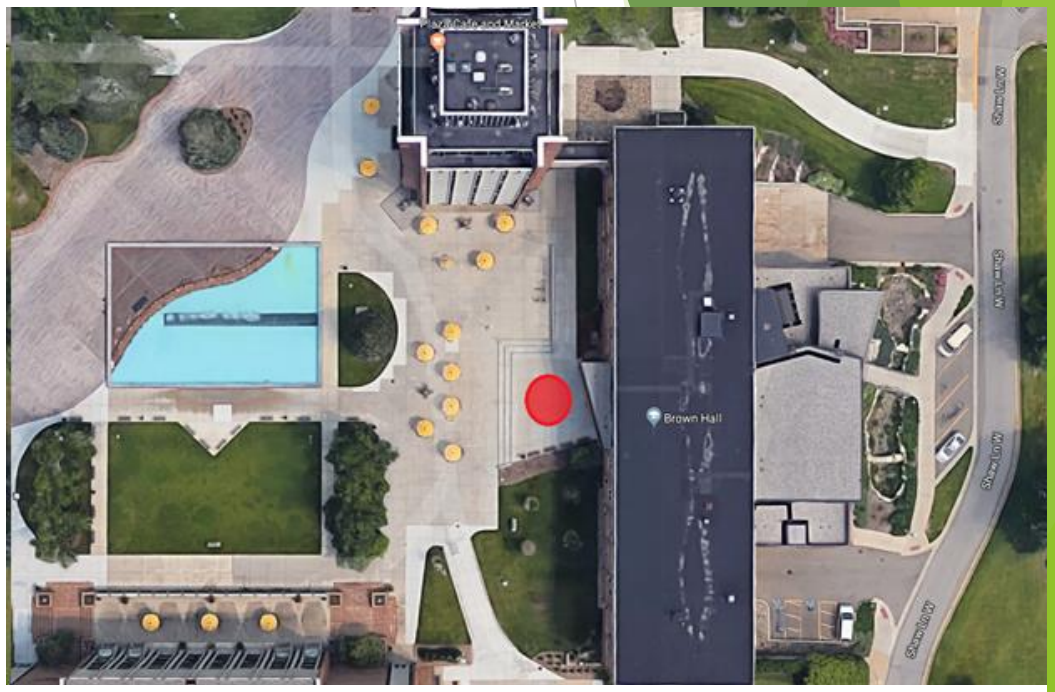

Figure 3.. Bench Location: Red area indicated on image is the approximate location of the Campus XL bench on Western Michigan University Campus. Adapted from Google, (n.d.), *Western Michigan University*, Retrieved from https://www.google.com/maps/@42.2798848,-85.6154256,106m/data=!3m1!1e3

Method- Baseline and Intervention

- Baseline data collection
  - Data will be collected for two weeks
  - Data will be general website hits to sustainability website
- Installation of Bench and prompt
  - Data will be collected for two weeks and evaluated
  - Data will be general website hits (from prompt and not) and specific hits generated by prompt

Potential Results

- Expected results
  - With implementation of solar bench and QR code prompt, website usage will increase

Implications

- More benches
  - New south neighborhood
  - Facilities interested
  - University mainframe
- Spread visibility
  - WMU has pockets of sustainability (Sangren, Solar Farm)
  - Will make WMU an overall ‘greener’ campus
- Student research
  - Ability of undergraduate students to participate in data collection and use bench(es) for further projects

Future Research

- Not as expected results
  - Changes to prompt can be made
    - Placement
    - Color
    - Wording
- Expansion of prompt
  - Demographics
  - Visual feedback

Conclusion

- Large implications on visibility of sustainable actions at WMU
- Outlook on saliency of bench
- How well barriers were addressed
- Open door for more benches

References

- AASHE. (2005). Mission, Vision & Commitments. Retrieved March 11, 2019, from https://www.aashe.org/about-us/mission-vision-commitments/
- AASHE. (2019, January 9). STARS, Sustainability Tracking Assessment & Rating System. Retrieved March 11, 2019, from https://stars.aashe.org/resources-support/help-center/the-basics/how-were-the-credits-developed-and-weighted/
- Association of University Leaders for a Sustainable Future. (1990). *Talloires Declaration*. Talloires, France.
- Atkinson, R. C., & Blanpied, W. A. (2008). Research Universities: Core of the US science and technology system. *Technology in Science, 30*, 30-48. Retrieved January 27, 2019.
- Ballantyne, R., & Packer, J. (2005). Promoting environmentally sustainable attitudes and behaviour through free-choice learning experiences: what is the state of the game?. *Environmental Education Research*, *11*(3), 281-295.
- Binder, K. J. (2012). *The effects of replacing dispersed trash and recycling bins with integrated waste receptacles on the accuracy of waste sorting in an academic building* (Unpublished master's thesis). Western Michigan University. Retrieved January 30, 2019.
- Brin Hamilton Photography and Design. (2019, February 11). Campus XL Info-Graphic [Digital image]. Retrieved February 11, 2019.
- Burger, J. (2012). Rating of worry about energy sources with respect to public health, environmental health, and workers. *Journal of Risk Research, 15*(9), 1159-1169.
- Create your QR Code for free. (2014). Retrieved February 10, 2019, from https://www.qr-code-generator.com/
- Gao, Y., Liu, T., & Paas, F. (2016). Effects of mode of target task selection on learning about plants in a mobile learning environment: Effortful manual selection versus effortless QR-code selection. *Journal of Educational Psychology, 108*(5), 694-704.
- Google, (n.d.). *Western Michigan University*. Retrieved from https://www.google.com/maps/@42.2798848,-85.6154256,106m/data=!3m1!1e3
- Horhota, M., Asman, J., Stratton, J. P., & Halfacre, A. C. (2014). Identifying behavioral barriers to campus sustainability: A multi-method approach. *International Journal of Sustainability in Higher Education*, *15*(3), 343-358.
- Lai, H., Chang, C., Wen-Shiane, L., Fan, Y., & Wu, Y. (2013). The implementation of mobile learning in outdoor education: Application of QR codes. *British Journal of Educational Technology, 44*(2), E57-E62.
- O'Neill, G. W., Blanck, L. S., & Joyner, M. A. (1980). The use of stimulus control over littering in a natural setting. *Journal of Applied Behavior Analysis, 13*(2), 379-381.
- Petersen, J. E., Shunturov, V., Janda, K., Platt, G., & Weinberger, K. (2007). Dormitory residents reduce electricity consumption when exposed to real-time visual feedback and incentives. *International Journal of Sustainability in Higher Education*, *8*(1), 16-33.
- Trevellyan, S. (2017, July 24). How to set up and track QR code with Google analytics. Retrieved February 19, 2018
- Sunbolt. (2018). Campus XL 2018 installation and operating instructions.
- ULSF. (2015). Brief History of the Talloires Declaration. Retrieved January 30, 2019, from http://ulsf.org/brief-history-of-the-talloires-declaration/
- UNCC. What is the paris agreement? Retrieved January 29, 2019, from https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement
- Van Zandt, D. (2016, November 27). ScienceDirect. Retrieved March 11, 2019, from https://mediabiasfactcheck.com/sciencedirect/
- Zhang, H., Dai, H., Lai, H., & Wang, W. (2017, September 27). U.S. withdrawal from the Paris Agreement: Reasons, impacts, and China's response.